

REMARKS/ARGUMENTS

The present invention teaches a method for improving the stability of the free layer through the introduction of a second pair of stabilizing layers, located either above or below the standard stabilizing layer and magnetizing it in a direction that is antiparallel to that of the first bias layer, thereby magnetostatically canceling out most of the external field of the first bias layer. Additionally, it is essential for the present invention to operate as claimed that the first pair of stabilizing layers not overlap the free layer.

Review of examiner's previous arguments for rejecting all claims:

Examiner has relied primarily on Gill, particularly figures 4 and 5. In these figures Gill shows a free layer 68 abutted by a pair of opposing permanent magnets 88 that provide longitudinal bias to the free layer. Additional longitudinal bias of the free layer is provided by an opposing pair of synthetic AFM structures 176.

An important feature of Gill is the presence of seed layer 130 between permanent magnet layer 88 and the lower soft magnetic layer 180 (of the synthetic AFM). Layer 130 is in direct contact with both layers 88 and 180. For Gill's invention to operate in the manner claimed, it is required (by Gill) that layer 130, in addition to having the necessary crystal structure to serve as a seed layer, must also be magnetic (see col. 5 line 45) in order to maximize the coercivity of the synthetic AFM structure.

Since layer 130 is in direct contact with bias layer 88 they will behave as a single magnetic entity so that flux passing through layer 88 will emerge both at its plane of abutment with the free layer as well as from layer 130 where it overlaps the free layer. This is fundamentally different from the present invention which claims bias layers that abut, but do not overlap in any way, the free layer. As a result, Gill's structure, in

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addition to providing longitudinal bias, also weakens the field at the edge of the free layer. The structure taught by the present invention does not have this weakness.

We have pointed out this difference between Gill and the present invention in every response that we have submitted but examiner has never acknowledged, let alone rebutted, this argument.

An additional fundamental difference between Gill and the present invention is that the bias 150 that is given to the free layer is parallel to the bias 158 that is provided by secondary bias layer 134 whereas, in the present invention, the secondary bias is required to be antiparallel to the primary bias. This difference between Gill and the present invention has been in every response that we have submitted but examiner has never acknowledged, let alone rebutted, this argument either. In order to emphasize this feature of the present invention we have added a qualifying phrase in claims 1, 9, 17, and 25 that explains the reason for this limitation.

Reconsideration is requested of the rejection of claims 1, 5, 17, and 21 under 35 U.S.C. 102(e) as being anticipated by Gill (US 6,822,836):

In his summary of Gill, examiner has made two errors:

(1) As explained above, Gill's permanent magnets DO overlap the free layer, specifically through their direct connection to magnetic layer 130 (which overlaps free layer 68). We respectfully request that examiner either allow all claims or explicitly explain how, in his view, bias layer 88 is not in contact with magnetic layer 130 and/or how, in his view, layer 130 does not overlap the free layer.

(2) In FIG. 4 the direction of additional bias is direction 154, not direction 164, as examiner states. This is because layers 130 and 142 are antiferromagnetically coupled, thereby biasing any magnetic layer that is in contact with layer 130 in direction 154 and any magnetic layer that is in contact with layer 142 in direction 164. So if, for example, layer 104 had been magnetic, it would have been biased in direction 164. We

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respectfully request that examiner either allow all claims or explicitly explain how, in his view, the free layer can be biased in an antiparallel direction despite its intimate contact with a layer that is biased parallel to the free layer.

Reconsideration is requested of the rejection of claims 9, 13, 25, and 29 under 35 U.S.C. 103(a) as being unpatentable over Gill in view of Nagasaka et al. (US 2003/0123200):

Nagasaka has been invoked to show that bias layers may be located both below as well as above the free layer. We offer no response to this.

Reconsideration is requested of the rejection of claims 2-5, 6-8, 10-12, 14-16, 18-20, 22-24, 26-28, and 30-32 under 35 U.S.C. 103(a) as being anticipated by Gill/ or Gill and Nagasaka et al. in view of Fukui et al. (US 2004/0047087):

Fukui et al. has been invoked to show that an additional bias layer can have good exchange coupling with antiferromagnetic layers. This cannot be disputed but the relevance of this fact to our claims 10, 18 and 26 is unclear since these claims teach only the type of head that is claimed. Furthermore, all claims cited are dependent claims whose allowance will be automatic following the allowance of all independent claims which we expect for the reasons presented earlier.

Examiner's response to our most recent arguments

Following our amendment of all independent claims to explicitly claim that the primary bias layers do not overlap the free layer, either directly or through connection to another magnetic layer, examiner sustained his rejection (based on 35 USC 112) on the grounds that said independent claims, as now amended, claimed no overlap with ANY

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magnetic layer, which contradicted our drawings. We answered this by parsing the clauses involved to show that no overlap of ONLY the free layer was being claimed, as follows, the relevant clauses being:

"providing a pair of opposing permanent magnet layers separated by a first gap and magnetized in a first direction, that abut, and do not overlap in any way, including a direct connection to another magnetic material, said free layer, thereby providing longitudinal bias thereto".

Stripped of the various qualifiers that make up much of this clause, it now reads as follows:

".... a pair of opposing permanent magnet layers that abut, and do not overlap...., including a direct connection to another magnetic material, said free layer,"

so it becomes evident that the subject clause is "a pair of opposing permanent magnets ", the predicate clause is "that abut and do not overlap", and the object clause is "said free layer", while "including a direct connection to another magnetic material" is an adverbial clause that further qualifies the predicate clause.

The above analysis, we believe, has made it clear that the object that is abutted, but not overlapped, is the free layer, and only the free layer, and not "any other magnetic material".

Examiner has responded to the above argument by stating "Following representative's grammatical analysis, the prior art reads claims well as described in rejection presented above.". While we are uncertain as to what precisely this means, examiner has not repeated his rejection under 35 USC 112 so we assume that examiner no longer interprets the meaning of claims 1, 9, 17, and 25 differently from us.

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Yet, once again, examiner makes no attempt to rebut these claims in light of their current amendments stating simply "Rejection maintains".

Examiner also stated "Since above presented rejection is fairly based on Fig. 3 in prior art, and has no contradiction with Fig. 5 in Prior art although Fig. 5 has not been recited in rejection. Applicant's arguments are found moot.". We are unclear as to what this means. Is examiner saying that ALL our arguments are moot because Gill's Fig. 3 does not contradict Gill's Fig. 5 or that only some of our arguments are moot? If the latter, may we respectfully enquire as to which particular arguments examiner has in mind. Pending further clarification from examiner, we are unable to see how the absence of a contradiction between two of Gill's figures renders any of our arguments moot.

In light of the foregoing arguments, applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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